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ABSTRACT

The cognitive characteristics involved in a relatively field-dependent or field-independent cognitive style and the personal characteristics associated with these contrasting styles have been shown to play a role in a) students' selection of electives and majors, b) vocational preferences they experience early in their academic careers, and c) the vocational choices they make. These characteristics have been related as well to performance in different subjects in school and in later vocational choice; they have also been implicated in shifts in majors during the college years. Finally, they have been found to influence teachers' ways of teaching and students' learning patterns. Students and teachers matched in cognitive style show positive mutual evaluation, whereas teachers and students who are mismatched tend to evaluate each other negatively. (Author/JB)

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RESEARCH BULLETIN

THE ROLE OF COGNITIVE STYLE IN ACADEMIC PERFORMANCE AND IN TEACHER-STUDENT RELATIONS

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The Role of Cognitive Style in Academic Performance and in Teacher-Student Relations[1,2]

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I. Introduction

The past two and a half decades have seen a vast amount of research on what have come to be known as "cognitive styles." It is a tribute to the value and vigor of this effort that, increasingly, the concepts and methods derived from cognitive-style research are finding fruitful application to a very wide array of psychological issues. Perhaps the most promising and exciting prospects for a cognitive-style approach lie in the field of education. While relatively little research has been done, compared to what is possible and needed, it is already clear that cognitive style is a potent variable in students' academic choices and vocational preferences; in students' academic development through their school career; in how students learn and teachers teach, and in how students and teachers interact in the classroom. It is with these issues that I will concern myself in this paper.

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II. The Nature of Cognitive Styles

From evidence accumulated in the course of more than 20 years of research in many different centers, we now know that all of us have characteristic modes of functioning that we show throughout our perceptual and intellectual activities in a highly consistent and pervasive way. We call these modes of functioning "cognitive styles."

I should like to describe one such cognitive style that illustrates the family of cognitive styles now on record. This particular style--which we call "field-dependence-independence"-- is one in which my colleagues and I have been especially interested over the years (Witkin, Dyk, Faterson, Goodenough & Karp, 1962; Witkin, Lewis, Hertzman, Machover, Meissner & Wapner, 1954). The best way to begin an account of field-dependence-independence is to describe the actual situations used to identify individual differences along this dimension.

One kind of test is conducted in a completely darkened room. The apparatus for this test consists of a square frame, coated with luminous paint, and a rod, pivoted at the same center as the frame, also coated with luminous paint. This is all the subject is able to see. Rod and frame can be tilted clockwise or counterclockwise, together or separately. In a typical trial, the subject, upon opening his eyes, finds rod and frame in tilted positions. If he reports that the rod is tilted, he is asked to adjust it to a position where it appears upright, while the frame remains in its initial position of tilt.

Children--and adults as well--differ markedly from each other in how they perform this task. At one extreme of the performance range are people who, in order to perceive the rod as upright, require it to be aligned with

the surrounding frame. If the frame is tilted 30 degrees to the left, they will tilt the rod 30 degrees to the left, and when the rod is in that position, say it is perfectly upright. If the frame is tilted 30 degrees to the right, they will then tilt the rod 30 degrees to the right and say the rod is perfectly upright in that position. This is one extreme of the performance range. At the other extreme of the performance range is the person who is able to bring the rod close to the upright, more or less independently of the position of the surrounding frame.

Another situation we use may appear to be very different from the one just considered, but in its essence it is very similar. Here the object of perception is not a "stick out there" but the body itself. The apparatus for this test consists of a small room into which a chair is projected. Room and chair can be tilted clockwise or counterclockwise, together or independently of each other. At the outset of each trial, the subject's chair and the room are brought to prepared tilted positions, and the subject's task is to adjust his body to an upright position. Here again we find very marked individual differences in performance. There are people who, in order to perceive the body itself as upright, align it with the surrounding tilted room. Astonishing as it may seem, some people actually can be tilted as much as 30 degrees and in that position report that they are perfectly straight, stating that "this is the way I sit when I eat my dinner," that "this is the way I sit in class." At the other extreme of the performance range are people who, regardless of the position of the surrounding room, are able to bring the body more or less to the upright.

There is a third situation we use, which is quite different from the first two, but which carries the same message. Here the subject is first shown a simple figure. It is then removed and he must locate it in a complex design of which it is a part. While this situation does not involve space orientation, as the first two did, the structure of the task is essentially the same. Here, too, the subject is presented with an item--now a simple figure rather than the rod or the body--which is contained in a complex, organized field. Once again, what is at issue is the extent to which the surrounding visual framework dominates perception of an item within it. What we do here is to "use up" the lines of the simple figure in various subwholes of the complex design, so that, perceptually, the simple figure no longer seems to be there. Here again, individual differences in performance are very marked and similar in nature to the ones I described for the first two tasks. For some people, the sought-after simple figure more or less "pops out" of the complex design, whereas others are not able to find it in the three minutes allowed for search.

I should mention that in the first two situations the subject's score is the amount of tilt of rod or body, in degrees, when these items are reported to be straight. In the embedded-figures test, the subject's score is the time taken to locate the simple figure in the complex design. In all three situations, we come out with a quantitative indicator of the extent to which the subject's perception of an item has been influenced by the organized field surrounding it.

In the three tests of field-dependence-independence I have described as illustrative, a more field-independent style is associated with greater

accuracy. I should emphasize that we also have devised situations where adherence to the prevailing visual field has been made to result in more accurate performance, so that it is the relatively field-dependent person who, following this approach, turns out to be accurate and the relatively field-independent person inaccurate (Witkin, 1950, 1952).

Important for the concept of cognitive style is the evidence that people tend to be self-consistent in performance across these three tasks (and, I might mention, many others similar to them). If the same subjects are tested in these three situations, we find that the person who tilts the rod far toward the tilted frame is likely to be the person who tilts his body far toward the tilted room, and he is also likely to be the person who takes a long time to find the simple figure in the complex design.

As must be evident from the descriptions I have given, the common denominator underlying individual differences in performance in all these tasks is the extent to which a person is able to deal with a part of a field separately from the field as a whole, or the extent to which he is able to disembed items from organized context or, to put it in everyday language, how analytical he is. Because at one extreme of the performance range perception is strongly dominated by the prevailing field, we speak of that mode of perception as "field dependent." For the other extreme, where the person is able to deal with an item independently of the surrounding field, we use the designation "field independent."

I should point out that people are strikingly stable, even over many years, in their characteristic mode of perceiving (Bauman, 1951; Witkin et al., 1954; Witkin, Goodenough & Karp, 1967). I should also point out that there are sex differences in field dependence. To state their nature quite operationally,

out of respect for the times: Girls and women are likely to tilt the rod farther toward the tilted frame and their bodies farther toward the tilted room than boys and men, and they take significantly longer to find the simple figure in the complex design.

Let me say that in place of the rather complex gadgets I described there are now available much simpler devices for conducting tests of field dependence. For example, there is now a small table-top model of the rod-and-frame apparatus, that can easily be transported to where subjects are to be found and that makes a darkroom unnecessary (Oltman, 1968). There is also now a group form of the embedded-figures test that makes large-scale testing possible.

Thus far we have been considering the ways in which people function when dealing with an immediately present stimulus configuration--in other words how they perceive. Extensive evidence accumulated over the years shows that the style we first identified in perception appears in problem-solving behavior and in thinking as well. The individual who, in perception, cannot keep an item separate from the surrounding field is also likely to have difficulty with the kind of problem that requires taking some critical element out of the context in which it is presented and restructuring the problem material so that the element is now used in a different way. This is often the requirement in problems of mathematical reasoning, for example. Let me state emphatically that it is only with problems which, like the tests of perceptual field dependence themselves, require disembedding of salient element from context that field-dependent persons experience difficulty. Field-dependent and field-independent persons are not particularly different in their performance

on other sorts of problem-solving tasks that do not have this requirement--for example, tasks involving verbal skills of the kind so heavily featured in the usual standard test of intelligence.[3]

The evidence on self-consistency shows clearly that there exists a broad dimension of individual differences which extends across perceptual and intellectual activities. Because what is at issue is the person's characteristic approach to a wide range of situations, we call it his "style," and because this approach encompasses both perceptual and intellectual activities, we speak of it as his "cognitive style." I should emphasize that the concept of cognitive style does not imply that there are two "types" of people--field dependent or field independent. Scores on any test of this dimension form a continuous distribution. As with a characteristic such as height, a person's standing on the dimension is defined relative to the mean.

There is now a good deal of evidence that this style extends into other psychological domains, beyond cognition. Persons who are relatively field dependent or field independent are also different in important personal characteristics. For example, the person who, in the laboratory, is strongly influenced by the immediately surrounding visual framework in his perception of an item within it, is also likely, in social situations, to use the prevailing social frame of reference to define his attitudes, his beliefs, his feelings, and

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[3]Of the three main factor components of the commonly used Wechsler scales (Cohen, 1957, 1959; Goodenough & Karp, 1961; Karp, 1963), one happens to be essentially identical with the field-dependence-independence dimension, based as it is on three particular Wechsler subtests assessing competence in disembedding. It is therefore not surprising that measures of field dependence relate very highly to scores for this factor but minimally to scores for the other two factors. In view of the important cognitive domains constituting an individual's intellect to which field-dependence-independence does not relate, we clearly cannot equate the field-dependence-independence dimension with general cognitive competence, or "intelligence," even though that dimension must be considered an ingredient of intellect.

even his self-view from moment to moment. So, if you substitute for the square wooden frame a social frame of reference, and for the stick an attribute of the self, such as an attitude or a sentiment, then indeed there is continuity in what a person is likely to do, across both laboratory perceptual situations and social situations.

Let me cite the results of a few of the many studies that have explored this relation. In forming their attitudes on an issue, field-dependent persons are especially prone to be guided by the positions attributed to an authority figure or peer group (Bell, 1964; Deever, 1967; Linton & Graham, 1959). Reflecting their use of external sources of information for self-definition, field-dependent persons are selectively attentive to the human content of the environment. Thus, they literally spend more time looking at the faces of those with whom they are interacting (Konstadt & Forman, 1965; Nevill, 1971; Ruble & Nakamura, 1972). The face is, of course, a major source of information about what others are feeling and thinking. To the extent that they look at faces more, it is not surprising that field-dependent persons also tend to be better at remembering faces (Crutchfield, Woodworth & Albrecht, 1958; Messick & Damarin, 1964). Their special attention to the social environment is not limited to faces of others; it is reflected also in their superiority over field-independent persons in attending to, and hence remembering, verbal messages that are more social in content (Eagle, Fitzgibbons & Goldberger, 1966; Eagle, Goldberger & Breitman, 1969; Fitzgibbons & Goldberger, 1971; Fitzgibbons, Goldberger & Eagle, 1965; Goldberger & Bendich, 1972). Finally, again reflecting their reliance on external social standards, field-dependent subjects show a significantly stronger tendency than field-independent subjects to adapt their performance on a cognitive

task to a modelling demonstration viewed on TV (Toomey, 1972) and to be more responsive to differences in emotional content (aggressive or neutral) of TV programs (Thomas, 1971). Later, when I come to the role of cognitive style in teacher-student interaction, I will add to this roster of observations which together show impressively that field-dependent persons are particularly sensitive and attuned to the social environment. The result, overall, is a picture of highly developed social skills.

With evidence like this it is now possible to say that field independence is a manifestation in the perceptual sphere of a broad dimension of personal functioning which extends into the sphere of social behavior and into the sphere of what may be called personality as well.[4] It is important to bear in mind for our later discussion of educational problems that though "cognitive" is featured in the label "cognitive style," style as used here subsumes personal as well as cognitive characteristics. As we shall see, both must be considered in making predictions and interpreting findings on how cognitive style figures in various aspects of the educational process. It is also worth noting that because these styles show themselves in perception, where they are readily accessible to observation and assessment by controlled laboratory techniques, they offer an objective route to the study of individual differences in personal functioning.

How do these individual differences arise? We and others have been pursuing this problem in two directions. One has been to examine the effects

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[4]For an extended account of personality characteristics associated with this dimension see, for example: Witkin et al., 1954; Witkin, 1965; Witkin et al., 1962.

of child rearing and socialization and the other has been to examine the role of genetic factors.

Studies of experiences in the family of children who turn out to be relatively field dependent or field independent have indeed demonstrated that the kind of relations the child has with his mother while growing up is very influential in determining his cognitive style (Dyk, 1969; Dyk & Witkin, 1965; Seder, 1957; Witkin et al., 1962). The characteristic of child rearing that seems most closely associated with the development of a more field-independent style of functioning, for example, is the early encouragement of autonomous functioning. Such an emphasis, let me mention parenthetically, may involve too much of a push towards independence; it may be overdone, with detrimental consequences for the child's overall mental health.

In a further effort to identify the socialization experiences contributing to the development of a more field-dependent or field-independent style, we and others have also been doing cross-cultural studies. The strategy in these studies has been to go to nature itself to locate more extreme variations in child-rearing practices than are available in our ordinary work settings. Recently, my colleagues, Price-Williams, Oltman, van Meel, Bertini, Ramirez, Christiansen, and I have completed a study of children from two small and relatively self-contained villages in each of three countries--Italy, Holland and Mexico. The two villages in each pair were chosen because of the marked difference between them in the child-rearing practices earlier found relevant to the development of field-dependence-independence. Other investigators, following a similar strategy, have selected for assessment of cognitive style other cultural settings as radically different from our own as, for example,

the Temne of Sierra Leone, Africa, the Eskimo of Baffin Bay, the Arunta of Australia, the Boat People and Hakka of Hong Kong (Berry, 1966; Dawson, 1967a,b, 1969, 1971). The evidence accumulated from these many cross-cultural studies demonstrates impressively that development of a more field-dependent or field-independent cognitive style is indeed related to socialization, and, moreover, that the socialization procedures associated with one trend in development or the other are essentially those we identified in our earlier studies. That socialization experience can contribute in an important way to the development of individual differences in field dependence is now abundantly clear.

As I mentioned, we are also pursuing the possibility that genetic factors enter into the development of this rather basic cognitive style. Our interest in genetic factors was stimulated by the persistent finding of sex differences in field dependence, now demonstrated in hundreds of studies performed in many different parts of the world. If genetic factors are involved in field dependence, the sex chromosomes are especially likely to be implicated, although not necessarily to the exclusion of autosomal chromosomes.

We are now engaged in three kinds of studies pursuing this possibility. One, conducted by Goodenough, Pizzamiglia, Ancona and myself, is a study of patterns of family correlations in measures of field dependence, in which a check is being made of predictions about extent of resemblance of son and daughter to each parent, derived from the hypothesis that a recessive gene on the X chromosome plays a role in the development of individual differences in field dependence. The second, conducted by Goodenough, Hirschhorn, Mednick, Schulzinger, Schiavi, Phillip and myself, is a study of cognitive style in

men who, in addition to the usual XY sex-chromosome complement, have an extra Y chromosome (XYYs) or an extra X chromosome (XXYs). The case-finding part of the study, now well underway, is being done in Denmark because of the excellent social records maintained there. In the third study, which Goodenough, Pizzamiglia, Ancona, and I are conducting, the linkage method is being used. For this study three-son families have been identified in which two sons share one of the mother's two X chromosomes while the third has received her other X chromosome. To make these chromosomal determinations, such X-linked somatic characteristics as color blindness and blood features were used as markers. If there is indeed a gene on the X chromosome contributing to the development of individual differences in field-dependence-independence, the two brothers with the same X chromosomes should be significantly more similar on this dimension than either is to the third brother. The data-gathering phase of this study, which is being carried out in Ferrara, Italy in order to take advantage of case identifications made there earlier, is already completed.

In overview, it seems fair to say from the evidence now on hand that socialization factors are undoubtedly of overwhelming importance in the development of individual differences in field-dependence-independence. At the same time it may be that genetic factors are implicated as well, although probably to a much smaller degree. If they are implicated, we feel we should know about the role they play, in interaction with social factors.

I have examined in some detail one well-studied cognitive style to give you some impression of what cognitive styles are like. As mentioned, a number of other cognitive styles have been described in literature. Among these are the styles of leveling-sharpening, constricted-flexible, reflective-

impulsive, tolerance-intolerance for unrealistic experience, analytical-relational-inferential, and automatization (Broverman, 1960; Gardner, Holzman, Klein, Linton & Spence, 1959; Gardner, Jackson & Messick, 1960; Kagan, Moss & Sigel, 1963; Kagan, Rosman, Day, Albert & Phillips, 1964). These styles have not been investigated as extensively as the field-dependence-independence dimension, and most have not yet been examined in their implications for educational problems. Accordingly, in the discussion that follows, the evidence to be considered comes particularly from studies in which field-dependence-independence was the cognitive-style variable considered.

III. Cognitive Style as a Factor in Academic Evolution

The first application of the cognitive-style approach to problems of education I want to examine is in the area of students' academic evolution. The evidence is now clear that cognitive style is an important variable in the preferences students express and in the choices they actually make at various points in their academic development wnen options are available to them. So, how field-dependent or field-independent a student is plays an identifiable role in his selection of electives and majors, in the vocational preferences he expresses early in his academic career, and in the vocational choice he makes later on. Field-dependence-independence has also been related to performance in different subject-matter areas in school and in vocation chosen. It is especially impressive that a linkage between cognitive style and academic choice and achievement is already clearly evident as early in a student's academic career as the elementary and high school levels.

Underlying the connection between field-dependence-independence and academic and vocational choices is, first of all, the degree to which a given academic or vocational area calls for the particular cognitive skills involved in a more field-dependent or field-independent style. Contributing to the connection as well are the personal characteristics associated with these cognitive styles. The frequently found sex differences in field dependence also seem to enter into the differences that have been observed between men and women in academic choices and vocational preferences. Finally, cognitive style has been implicated in the important phenomenon of shifts in major during the college years.

The evidence to be reviewed now, as I consider each of these issues in more detail, comes from extensive work by others as well as from a large scale longitudinal study my colleagues Oltman, Freedman, Raskin, Goodenough, and I are now doing on the role of cognitive style in academic evolution at the higher-education level. Briefly, in that study the entire entering class of 1600 men and women in a large municipal college was assessed at admission on tests of field dependence, as well as on tests of verbal comprehension, another salient cognitive dimension. This class was graduated a year and a half ago. For each student we have transcripts of his or her complete college record. Included in the record is information about courses taken, grades received, majors chosen, changes in major, academic difficulty, special achievements and, finally, graduate-school choices when made. For a subsample of students we also have the results of an extensive battery of tests we ourselves gave them over their four years in college. Included in the battery was a wide array of cognitive tests as well as interest inventories, personality

tests and an interview. These extensive and varied data make it possible to examine the relation between cognitive style and a number of features of academic performance.

The availability of data on the verbal-comprehension dimension has now also allowed us to take the important step of examining the way in which particular cognitive patterns figure in students' academic development. The patterns we are looking at are given combinations of field-dependence-independence and verbal-comprehension ability. To this end, we identified for special study five groups of students, consisting of both men and women, each presenting a different pattern with regard to level of performance in the two domains. One group was field independent and high in verbal-comprehension ability, the second field dependent and also high in verbal-comprehension ability, the third relatively field dependent and relatively low in verbal-comprehension ability, the fourth relatively field independent and again relatively low in verbal-comprehension ability, and the fifth intermediate on both dimensions. Of particular interest to us are the groups showing a marked discrepancy in level of functioning between these two cognitive domains--in other words, cognitive splits. Among the groups with such cognitive splits, the fourth group listed shows a pattern likely to be characteristic of those from culturally deprived backgrounds, and so deserves particular attention in this period of concern with education of the underprivileged.

While analyses of data from this study are still under way, there are already some results that are relevant to the issues we are considering. These will be cited along with the results of studies by others.

The scores of students on interest inventories and vocational preference inventories have been examined in relation to field dependence in a multitude of studies, using a variety of inventory forms and considering students at different educational levels (see, for example, Chung, 1966; Clar, 1971; DeRussy & Futch, 1971; Glatt, 1969; Krienke, 1969; Linton, 1952; Pierson, 1965; Zytowski, Mills, & Paepe, 1969). Not surprisingly, a consistent finding of most of these studies is that more field-independent students favor domains in which analytical skills are called for whereas more field-dependent students avoid such domains. Examples are the sciences (physical and biological), mathematics, engineering, technical and mechanical activities, etc.

Equally clear is the strong preference of more field-dependent students for domains that feature interpersonal relations and in which day-to-day work requires involvement with people. Examples are social sciences, rehabilitation counseling, elementary school teaching, social science teaching, "persuasive" activities (that is, those requiring dealing and meeting with people and promoting projects or things to sell), the humanities, office managing, selling real estate. The orientation toward the social surround reflected in these choices by field-dependent persons also snows itself in their tendency to prefer occupations favored by their peer group (Karp, personal communication; Linton, 1952). Karp's finding was obtained with ten-year-old boys, suggesting, as noted earlier, that the cognitive-style variable begins to affect career pathways quite early in life. Also reflecting an "early start" was the finding of Glatt (1969) that engineering was favored by eighth-grade boys who were field independent. And I might mention here that examination of the high-school records of the students in our longitudinal four-year college study showed that

those who tested out field independent at college admission had taken more advanced optional mathematics and science courses in high school than those who were field dependent.

A highly similar picture to the one found when interests and preferences are examined emerges when actual choices of majors in college are studied. This was shown, for example, in the study by Clar (1971). It was evident as well in the data from our own longitudinal study. It is worth noting, in passing, that, in contrast, in our study, choice of major showed no relation to standing on the verbal-comprehension dimensions.

Cognitive style has also been examined in students showing high achievement in particular subject-matter areas, in students committed to a given profession, and in persons already working within a profession (Arbuthnot & Gruenfeld, 1969; Barrett & Thornton, 1967; Bieri, Bradburn & Galinsky, 1958; Frehner, 1971; Holtzman, Swartz & Thorpe, 1971; MacKinnon, 1962; Rosenfeld, 1958; Rosett, Nachamson, Robbins & Sapirstein, 1966; Sieben, 1971; Stein, 1968). In most of these studies the anticipated relation to field-dependence-independence was found.

There is also evidence connecting cognitive style to choices and performance within a given domain. Thus, first-year graduate students entering a program in clinical psychology--the "people" end of the psychological spectrum, if you will--were significantly more field dependent than students in the same school entering an experimental psychology program--the "thing" and "abstractions" end of the spectrum (Nagle, 1967). This outcome is undoubtedly a product of both self-selection by students and selection by program staff. Another study (Blatt & Quinlan, personal communication) found

that high-achieving students in psychiatric nursing were significantly more field dependent than high-achieving students in surgical nursing, who tended to be field independent. And in still another study (Nussbaum, 1963) systems engineers were found to be more field independent than other categories of engineers. Relevant here is the observation by Rosett, et al. (1966) that engineering students whose interests were mainly restricted to the physical sciences were more field independent than those whose interests extended into other domains as well.

A step along the important research path of broad-spectrum assessment of cognitive style in relation to interests, preferences and achievement was recently taken in the study by Chung (1966), already cited. This study examined Kuder Preference Scale performance in relation to the cognitive styles of leveling-sharpening, constricted-flexible and equivalence range, in addition to field-dependence-independence. Whereas field-dependence-independence related to interests, the other three styles, considered individually, showed little relation. At the same time, the patterns of the four styles, taken together, showed interesting relations to preference expressed. As one example those who favored elementary school teaching tended to be field dependent, flexible and intermediate both in leveling-sharpening and equivalence range. Those favoring the natural sciences tended to be field independent, broad in equivalence range and intermediate in constricted-flexible control and leveling-sharpening.

We have thus far examined the role of cognitive style in interests, preferences, choices and achievement. There is also evidence that relatively field-dependent and field-independent students are different in their conceptualizing of occupations and in the ease with which they make educational

and vocational choices. Some of the evidence comes from studies with children, again indicating the rather early influence of cognitive style in this domain.

Tyler and Sundberg (1964) examined the ways in which ninth-grade Dutch children classified occupational concepts. One kind of classification was characterized as concrete, immature, primitive and using association rather than similarity as a basis for grouping. Tyler and Sundberg found that children who never employed this variety of occupational classification almost all achieved scores on the field-independent side in our tests of field dependence, although the reverse was not true. Glatt (1969) found that field-independent eighth-grade boys showed relatively greater "readiness for occupational planning," as judged from interviews with them. To assess readiness such criteria were used as: awareness of factors relevant to curriculum choice and to occupational choice; ability to verbalize strengths and weaknesses; and accuracy of self-appraisal of cognitive abilities. And in still another study (Clar, 1971), this time with college students attending a university counseling center, the more field-independent students were rated by counselors as more realistic in their vocational choices and more articulated in vocational interests; they also showed more specialized choices and more primary interests. The field-dependent counselees, on the other hand, were more often definitely undecided about vocations at the termination of counseling. Consistent with this last finding, Osipow (1969) has reported that a group of college women uncommitted to a course of study, and admitting difficulty in making career choices, were significantly more field dependent than each of four other groups of women who were enrolled in specific programs and made career choices with relative ease.

The picture that emerges from these first few studies of the processes by which career choices develop as a function of cognitive style is one in which, early and late, relatively field-dependent students have more difficulty in defining and articulating their career choices.

In view of the well-documented case for sex differences in field dependence it is interesting to examine the interests-preferences-choices domain for men and women separately. The relations described between this domain and field-dependence-independence have been found to hold within each sex. Moreover, paralleling the tendency for men to be more field independent than women, and for field-independent persons to favor mathematics and science, we found in our longitudinal college study that more than twice as many men as women ended up majoring in these areas. Similarly, an overwhelmingly larger number of women than men majored in education, an area generally favored by more field-dependent persons. Twenty-seven percent of the women in the college class we studied majored in education compared to only two percent of the men. To be added to this network of facts about sex differences is the observation that relatively field-independent women strongly favor an "intellectual role" for themselves, whereas relatively field-dependent women favor a "women's role" equally strongly (Greenwald, 1968). This observation is consistent with the repeated finding that among women (as among men) those who are more field independent tend to score at the masculine end of masculinity-femininity scales (Crutchfield, et al., 1958; Fink, 1959; Miller, 1953).

It can hardly be assumed that the marked sex differences found in occupational preference and choice are to be fully explained on the basis of field-dependence-independence. Sex differences in this cognitive style, which appear

to be established before the time in life when occupational choices are made, may indeed be a factor in these choices. More important, it seems likely that the sex role assignments within our society which contribute to development of sex differences in field-dependence-independence also have an overriding part in the sex differences found in occupational choices.

One finding from our longitudinal study points up the possibility that in seeking to fulfill the expectations flowing from these role assignments, women themselves, as well as those responsible for the selection process, may actually be contributing to a self-fulfilling prophecy. We found that those women in our study who became mathematics majors, an atypical choice for their sex, were markedly and consistently outstanding, all of them scoring in the top quartile on the mathematics part of the Scholastic Aptitude Test and in the top (field-independent) quartile on a group form of the Embedded-Figures Test. Men who majored in math, on the other hand, showed more scatter in their scores on these two tests. What this finding probably signifies is that a woman who steps out of her traditional sex role, as she does in choosing mathematics, must really be very good--both in her own view and in the view of those who choose her--whereas a man who favors mathematics, a choice consistent with his sex role, can get by with less.

In documenting the existence of sex differences, whether in cognitive style, or in educational and occupational interests, preferences and choices, we are simply describing the situation as we now find it. There is no assumption, of course, that this is the way it must be. Should it be considered desirable to do so, whether by the individual or by society, the sex-differences picture in the linked characteristics of cognitive style and interests-preferences-choices can undoubtedly be altered. We will, however, be in a better position

to bring about such changes if we become more fully aware of the sex differences that do exist and better understand the forces responsible for their development.

We should not leave the sex differences issue without also pointing out that sex is likely to be an important moderator variable, influencing the relation between cognitive style and performance in the educational setting. (See, for example, Perney, 1971; Mebane & Johnson, 1970.) This is an important area for further investigation.

A final aspect of academic evolution I want to consider, in relation to cognitive style, is the important phenomenon of shift in majors. The relevant data come from our own longitudinal study. We determined for each student whether a shift did or did not take place from the major specified on college admission and the nature of the change when it occurred. First, we found that shifts tended to be more common among our relatively field-dependent students. This very likely carries the same message about difficulty in defining and articulating educational and career choices as does the previously mentioned observation that college women, uncommitted to a major and expressing difficulty in making a choice, were significantly more field dependent than women who had selected a major and did so with little difficulty.

Examination of the subject-matter areas involved in switches in major gives more specific meaning to the role of cognitive style in affecting change. Taking a lead from the observation that field-independent students tend to favor the mathematics-science domain, and field-dependent students the social-sciences-humanities domain, we looked particularly at shifts between these two domains as a function of cognitive style.

A first finding was that shifts out of mathematics and science were frequent whereas shifts out of social sciences and humanities were quite rare.

With regard to shifts out of mathematics and science we found that they were particularly common among the more field-dependent students. As a related finding, among students who initially designated themselves "premedical," a science domain, the relatively field-dependent ones more often abandoned this goal without ever applying to medical school. These shifts reflect movement toward a "better fit" between ability and career choice. Undoubtedly they resulted from the experiences these students must have had in their math and science courses, experiences that indicated to them their lack of the analytical skills necessary for adequate performance in these areas. Just as impressive as their ability to "read the signs" and to change major, however, was the great frequency with which the more field-dependent students made inappropriate initial choices. It is worth noting here that a student's standing on the verbal-comprehension dimension seemed to bear little relation to this particular change-of-major phenomenon.

In contrast to the frequent shifts out of the mathematics and science categories, we found, as noted, strikingly few shifts when social sciences and humanities were the initial choices, with no difference between more field-dependent and field-independent students in frequency of shifts. We may speculate that the difference between the picture of few shifts out of the social-sciences-humanities domain and the picture of frequent shifts out of the mathematics-science domain reflects the difference in relative specificity of the cognitive skills required by each. Clearly, in the mathematics-science domain

field independence or analytical ability is a specific requirement; without that ability it is difficult to make a comfortable home for oneself in this domain. Social sciences and humanities, on the other hand, are "broader gauge" in their requirements. Though field-dependent persons more often favor these disciplines, field-independent persons may also find a congenial existence there. Psychology, with its clinical and experimental ends, provides an example. As we saw, relatively field-dependent graduate students who entered this discipline gravitated toward the clinical end and the more field-independent ones toward the experimental end. In view of these considerations it should not be surprising that narrow-skill areas like mathematics and science should show more of an exodus than broad-skilled areas. Nor should it be surprising that more field-dependent students should be the main participants in the movement out of mathematics and science.

I should mention here that in our basic four-year college longitudinal study, we are not only taking a retrospective look at the high-school records of our students, but we are also now beginning a follow-up study of these same students into graduate school. In taking this step, we plan to examine the role of cognitive style in the decision to go on to graduate school; the kind of graduate school favored; eligibility for graduate school; specialty selected; and performance in different subject-matter areas in graduate school. The downward extension of our longitudinal study into the high-school period, joined now with this follow-up into graduate school, provides us with a 12-year period over which the implications of an individual's cognitive style for various facets of his academic development may be pursued.

A study in which we followed the same children over the 10- to 24-year-age period showed that an individual's standing on the field-dependence-independence cognitive style remains relatively stable over this age period (Witkin, et al., 1967). This observation makes it reasonable to believe that the cognitive assessments we made at the time of their admission into college is likely to reflect our students' cognitive makeup both in the earlier high-school period and in the later graduate-school period.

IV. Teaching, Learning and Teacher-Student Interaction as a Function of Cognitive Style

From all that has been said about both the cognitive characteristics involved in a more field-dependent or field-independent cognitive style, and about the personal characteristics associated with these contrasting styles, it is easy to see how a teacher's cognitive style may influence his or her way of teaching; how a student's cognitive style may influence his or her way of learning; and how a match or mismatch in cognitive style between teacher and student may determine how well they get along, with important consequences for the learning process.

It is interesting that the evidence available on these issues comes almost entirely from studies in which the students were of elementary or high school age. Essentially no work has been done with students on the college or graduate school levels, which are of special interest in this symposium. While this neglect of the higher-education period has many bases, one undoubtedly is the frequently made assumption, which I would seriously challenge, that at the college level such issues no longer matter. The advanced scholarship of the instructor and his devotion to his subject matter,

on the one hand, and the strong motivation of students who have made the voluntary choice to seek advanced training, on the other, are assumed to insure good teaching and good learning. I will present evidence later on that cognitive style operates in a similar way in other social-interaction contexts (for example, patient-therapist and interviewer-interviewee interactions) as it does in teacher-student interaction. The finding that, even with variations in ground rules from one social context to another, the role of cognitive style shows through in similar ways, suggests that the results to be presented of studies with younger students on the importance of cognitive style in teaching, learning and teacher-student interaction are probably applicable to older students as well, and makes a compelling case for extending these lines of work to the higher-education level.

I will consider first the role of cognitive style in teacher behavior, then in student behavior, and finally in teacher-student interaction. As you will see, most potent in its effect on the classroom situation is the particular combination of teachers' and students' styles, particularly whether matched or mismatched.

How Teachers Teach

Teacher's choice of specialty areas

It may be recalled here that those who favor teaching as a profession are, as a group, likely to be relatively field dependent. This observation fits the well-documented finding that field-dependent persons tend to favor occupations in which they spend their work-time with others rather than alone. In addition, choice of specialty area among teachers is related to extent of field dependence (DiStefano, 1969). For example,

teachers who select mathematics or science are likely to be field independent; those who select social sciences are likely to be field dependent. For reasons considered in our discussion of narrow-gauge and broad-gauge disciplines, it seems reasonable to expect that we would find a heavy concentration of more field-independent teachers in the mathematics-science domain, and a wider range of individual differences in cognitive style in the social-sciences-humanities domain.

Teachers at the higher-education level must pass through a longer period of self-selection and selection by others than teachers at other levels. Moreover, the requirements of the advanced material they teach are more demanding. It is interesting to speculate whether teachers within a specialty at the higher-education level are likely to show less diversity in cognitive style compared with teachers at lower educational levels. For example, are college mathematics teachers more homogeneously field independent than high school teachers of this subject?

Teaching strategy

Relatively field-dependent teachers have been found to prefer a discussion or discovery method of teaching, rather than a lecturing method, which is preferred by relatively field-independent teachers (Wu, 1967). Here again the tendency of field-dependent persons to seek interpersonal engagement, clearly more involved in both the discussion and discovery approaches than in lecturing, shows itself. Also, lecturing is more directive; in view of all we know about them, it is not surprising that field-independent teachers should favor such a teaching method. Confirming this observation, Ohnmacht (1967a) found that relatively field-independent teachers are more

direct in their attempt to influence students. Undoubtedly reflecting a similar difference between them, relatively field-dependent teachers have a more favorable attitude toward the use of democratic classroom procedures than field-independent teachers (Ohnmacht, 1967b, 1968).

It is impressive that the cognitive style of therapists has been found to have an effect on the conduct of therapy congruent with what has just been described for the teaching situation. Like the more field-dependent teachers who favor approaches that involve them with their students, relatively field-dependent therapists have been found to favor modes of therapy that make use of interpersonal relations with the patient as a vehicle for therapy. Field-independent therapists, on the other hand, favor either directive or noninvolving approaches, both essentially non-interpersonal (Pollack & Kiev, 1963). A result from a study we ourselves did (Witkin, Lewis & Weil, 1968) has a similar meaning: Our relatively field-dependent therapists interacted more with their patients than did our more field-independent therapists.

Studies by Ohnmacht (1967b, 1968) and Wu (1967) point up the important fact that <u>patterns</u> of teacher characteristics may relate to teacher behavior, even when the characteristics taken singly do not. The Ohnmacht study showed that teachers who were field dependent and high in dogmatism were less likely to be imaginative and stimulating in the classroom than those who were field independent and low in dogmatism. Yet neither field dependence alone nor dogmatism alone, dimensions which are orthogonal, showed a relation to these characteristics of classroom behavior. In Wu's study the same combination of field dependence and high dogmatism was

associated with greater effectiveness in handling student questions involving logical fallacies the teacher had to detect and then guide pupils toward finding the answers themselves.

Related to these studies of teachers' cognitive styles and their impact on teaching is a study by Rennels (1970) which evaluated the effect of teaching styles which he conceived to follow a more field-dependent or field-independent approach. Using disadvantaged urban black children selected from the two extremes of the field-dependence-independence dimension, Rennels attempted to train them in perception of spatial relations by either an "analytic" method, which he attempted to pattern in accord with a field-independent approach, or a "synthetic" method, supposedly patterned after a field-dependent approach. Contrary to expectations both field-dependent and field-independent children did better with training by the analytic method than with training by the synthetic method. An important question raised by these results is whether the learning of a particular kind of material (in this case spatial relations) may be favored by a particular kind of teaching method (in this case analytical), overriding the effects of teacher or student cognitive style. The role of such situational factors as material to be learned is important to consider in examining the effects of teachers' and students' cognitive styles.

Another kind of cognitive style has recently been implicated in the learning process in a particularly interesting way (Yando & Kagan, 1968). Teachers selected as reflective or impulsive in style taught children who were assessed on the same dimension. In end-of-year performance, children

taught by reflective teachers showed a change in the direction of a more reflective style. It was thus possible to influence the child's style itself through teacher behavior determined by her own style.

How Students Learn

Having examined the way in which teaching may be influenced by the teacher's cognitive style, let us turn now to the other side of the coin and consider how cognitive style may enter into the way a student learns.

First, it has been shown that how much knowledge students acquire by different teaching methods tends to be related to their cognitive style (Grieve & Davis, 1971). In this study, a comparison was made of the amount of geography learned with either an expository or discovering method of teaching by extremely field-dependent and extremely field-independent ninth-grade children. In the discovery method "verbalization of generalizations being taught was delayed until the end of the instructional sequence," whereas in the expository method "verbalization of the required generalizations was the initial step of the instructional sequence" (page 139). One interesting finding was that the more field dependent the boy the more likely was he to benefit from discovery instruction. This outcome makes sense when we consider that in the discovery method, compared with the expository method, learning takes place through interaction with the teacher, a context congenial to the social orientation of the more field-dependent student.

Research on cognitive style as a factor in another kind of social-interaction situation--patient-therapist relations--has come up with a finding that may have implications for the teacher-student interaction.

Greene (1972) recently reported that therapists significantly more often chose supportive therapy for their field-dependent patients than for their field-independent patients, for whom "modifying" therapy was favored. Karp, Kissin and Hustmyer (1970) obtained a similar result in a study of alcoholic patients. In light of the field-dependent person's need for structure from external social sources, it indeed makes sense that supportive therapy should be recommended for them. It seems reasonable to predict from such evidence that field-dependent students would find the learning situation more congenial and, hence, would learn more in a supportive setting.

We have already noted how strongly a student's cognitive style affects his choice of major and educational preferences. Ordinarily, students may be expected to do better in subject-matter areas that fit their cognitive style. However, such a generalization should by no means lead us to give up on field-dependent students in areas which do not fit their styles. For example, while field-dependent students may be limited in how far they are able to progress in advanced mathematics, it is likely that by teaching methods specifically attuned to their cognitive style, such students may do better than we now imagine. Spitler (1970), for example, has spelled out alternative methods of teaching mathematics to more field-dependent and more field-independent students, each method exploiting the cognitive style of the student for whom it is intended.

Relevant to our question of the role of cognitive style in how students learn is the repeated observation that children with learning difficulties, especially in the area of reading, tend to be field dependent (see, for

example, Robbins, 1962; Stuart, 1967; Severson, 1962; Keogh & Donlon, 1972; Bruininks, 1969). Though there is not sufficient space to consider what I believe to be the underlying basis of this connection, I merely cite it to show that cognitive style may provide a useful approach to the investigation of specific learning problems.

On still another front is a connection suggested between cognitive style and learning. Social reinforcement, usually taking the form of praise for good deeds and criticism for bad ones, is of course a common technique used by teachers as a stimulus to learning. The idea that there may be a relation between field-dependence-independence and social reinforcement arises very naturally, in view of the social characteristics of children with contrasting cognitive styles. As might be expected, therefore, this relation has been examined in many studies. (See, for example, Konstadt & Forman, 1965; Stark, Parker & Iverson, 1959; Ruble & Nakamura, 1972; Shapson, 1969; Fitz, 1970; Busch, 1970; Wade, 1971; Paclisanu, 1969; Randolph, 1971; Ferrel, 1970.) In most of these studies the outcome was the expected one. Relatively field-dependent children, reflecting their concern with the social surround and their reliance on external social standards, were more affected in their task performance by praise and/or criticism. On the other hand, relatively field-independent children, less oriented to the social environment and more prone to use inner standards, tended to be much less influenced. In addition, particular kinds of reinforcement were found to have a different effect on children of contrasting cognitive style. It is not difficult to imagine the important consequences for learning and teaching of such differences in children in response to social reinforcement.

Let me note in passing that in the results of these studies we have additional impressive evidence of the strong social orientation and great social sensitivity of the relatively field-dependent child.

How Teachers and Students Interact

The results of a recent study by DiStefano (1969) provide evidence on the consequences of match or mismatch in cognitive style between teacher and students. DiStefano had extremely field-dependent and extremely field-independent teachers describe their students, all of whom had been assessed for field dependence. Similarly, these students were asked to describe their teachers. (I should mention that teacher and students were all males.) The results were very striking. Teachers and students matched for cognitive style described each other in highly positive terms whereas teachers and students who were mismatched showed a strong tendency to describe each other negatively. Especially important in its implications for how teachers evaluate their students' abilities was the finding that teachers valued more highly the intellects of students similar to themselves in cognitive style, and not only the personal characteristics of these students. Similarly, students viewed more favorably the personal characteristics and cognitive competence of teachers similar to themselves in cognitive style.

Findings such as these raise the question of whether it is not too simplistic to speak just of "good teachers" and "bad teachers," even though by some criteria of competence such designations may be justified. It would seem more appropriate to think of teachers in terms of "good" or "bad" for what kind of student. Similarly, on the student's side, it may be useful to think not only of "good" or "bad" students but "good" or "bad" with what kind of teacher.

Effects of match or mismatch in cognitive style similar to these have been found in other kinds of interaction situations, pointing to the generality of these effects. Greene (1972), in the study cited earlier, found that patients from patient-therapist dyads where both were field dependent or both field independent tended to rate the therapist's relation toward them more positively than patients from dyads incongruent in cognitive style. It is noteworthy that no significant effects were found when the patient's style or therapist's style was considered by itself.

The powerful influence of the particular combination of cognitive styles of participants in an interaction, beyond the contribution made by the style of each considered separately, was also evident in the patient-therapist interaction study we did (Witkin, et al., 1968), cited earlier. As mentioned, relatively field-dependent patient and field-dependent therapist each participated more in the interaction than their field-independent counterparts, as judged by number of interactions during the therapeutic hour. The combined effect of these tendencies was particularly striking, however. For example, the combination of our most field-dependent therapist with his field-dependent patient produced 5.1 interactions per minute or 268 in the course of the therapeutic hour. This contrasts with only .8 interactions per minute, or 38 interactions, with the combination of our most field-independent therapist with his field-independent patient. Another indication of the interacting effect of dyad members' cognitive styles is found in the way in which the therapist's behavior, as a function of his cognitive style, is affected by the style of the patient. Though field-dependent therapists tended to intervene more than field-independent

ones, our therapists, regardless of cognitive style, showed a higher rate of intervention with their field-dependent than with their field-independent patients. We may also recall here that in the studies by Greene and by Karp et al. therapists adapted their therapeutic approach to the cognitive style of their patients, favoring a more supportive kind of therapy for field-dependent patients and a modifying form of therapy for their field-independent patients.

In still another kind of social-interaction context have the positive or negative effects of match or mismatch in cognitive style been observed. Shows (1967) analyzed the results of a questionnaire filled out by interviewer and interviewee after spending 20 minutes together, during which the interviewer's task was to find out as much as he could about the interviewee. Partners considered similar reported that they found it easier to understand each other, they were more interested in each other, and they viewed each other as more sympathetic. Not only do we again find more positive feelings developing between partners who are similar, but in the finding of "better understanding" there is also the suggestion of more effective communication.

It appears that the contribution of cognitive style to mutual attraction or dislike is evident even after a very short period of interaction. The effect Shows obtained occurred after 20 minutes of interaction. In the study by Lewis, Weil, and myself the effects noted were obtained in the very first hour of therapy. In another study by Goodenough, Oltman, Freedman and myself, recently completed, we were able to obtain evidence of cognitive-style effects after 25 minutes of interaction. Quite clearly the processes by which these effects are achieved work very quickly. Might this mean that

the consequences of cognitive style for the classroom situation are already established in the very first session teacher and student spend together? If so, are they strengthened with time or can they be modified? These are questions in need of research.

Still to be considered in its implication for the classroom is the effect of the subject matter being studied on teacher-student interaction as a function of their cognitive styles. Take mathematics for example. In view of the clear linkage between field independence and competence in mathematics, would things go differently as far as the effects of match or mismatch are concerned if mathematics is the subject-matter area rather than social sciences, for example?

The importance of taking situational factors into account, in assessing the effects of match or mismatch in cognitive style, was shown by the finding in the dyadic interaction study my colleagues and I did that characteristics of the task around which the subjects had to interact could modify cognitive-style effects.

The finding that people matched in cognitive style are likely to get along better in such social contexts as teacher-student, patient-therapist, and interviewer-interviewee interactions provides still another demonstration that similarity makes for mutual attraction. Of special interest here, however, is the question of the cues associated with cognitive style that people pick up about each other in the course of their interaction, even after a brief period of time together. They do not know each other's rod-and-frame test scores and, even if they did, I am sure they would not know what to make of them without the lengthy explanation I have given here.

Compared with the high visibility of similarity in attitude on the Vietnam war, for example, the cues reflecting on cognitive style are surely less tangible; yet they must be there and usable for the effects described to occur at all.

The question of cues leads to the larger question of the processes involved in the interaction between people which have liking or disliking as their end product. The answer to this complex question obviously has important implications for human relations at large. My colleagues, McDonald, Goodenough, Oltman, Potter, and I are in the midst of studies in which we hope to answer this question, in the context of the teacher-student-interaction situation.

The evidence on hand at the time we planned this study suggested that persons matched in cognitive style tend to get along better, under conditions where this outcome has been observed, for three possible kinds of reasons: first, because of shared foci of interest; second, because of common personal characteristics; and, third, because of similarity in communication modes, making for easier and more effective communication. Let me elaborate on each of these factors.

With regard to shared foci of interest, the evidence is overwhelming in showing that relatively field-dependent persons are especially sensitive to the social surround. Their shared tendency to attend selectively to the social content of the environment is likely to help two people of this kind to get along better when they interact. Similarly, when two field-independent persons interact, their shared interest in the more impersonal, abstract aspects of their surround should again make for a positive outcome in feelings toward each other.

To the extensive evidence in the preceding sections on the strong social orientation of field-dependent persons, I should like to add just one bit of evidence on what may be considered a "visible" aspect of social orientation, visible in the sense that it shows itself in overt behavior directly manifest to the other person. This evidence comes from a recent study by Justice (1969) which investigated the use of interpersonal space as a function of field dependence. The method used was really very simple. The subject was asked to prepare a brief talk on an assigned topic and then to go into an adjacent room to present this talk to the experimenter sitting there. On the whole this procedure tended to be rather anxiety provoking. The distance between the subject, at the point he stopped when he entered the room, and the experimenter was then measured. A chalk mark and ruler were the only props needed to make the assessment. The outcome was that relatively field-dependent subjects ended up significantly closer to the experimenter than the more field-independent subjects. This behavior reflects in a very concrete way the field-dependent person's need for closeness to others, especially under conditions of discomfort. Well, may this difference in need for physical proximity between relatively field-dependent and field-independent persons have a jarring effect, when two such people come together, with a potentially negative outcome for their feelings toward each other? In contrast, are persons similar in cognitive style more likely to assume positions in the physical space they share which is more congenial to each of them, again with more positive consequences for getting along?

Turning to the second possible basis for greater mutual attraction between persons of like cognitive style--similarity in personal

characteristics--again I want to add just one more item of evidence, also having to do with visibility, to the many already cited. White and Kernaleguen (1971) found relatively field-dependent female students more likely to wear clothes commonplace for their peer group, with regard to length, whereas the more field-independent students significantly more often wore clothes that were relatively unusual. The clothing a person wears is plain for all to see. Could differences in manner of dress between persons different in cognitive style possibly contribute to irritation, perhaps even immediately on encountering each other?

Finally, I would like to consider evidence suggesting that persons of the same cognitive style use similar modes of communication and that this, in turn, facilitates understanding, again with positive consequences for their ability to get along with each other. Here too I want to focus on characteristics that tend to be visible. First, from studies of psycholinguistic differences as a function of cognitive style, there is evidence that in their ongoing speech field-dependent and field-independent persons differ in the frequency with which they use particular word categories. One difference is in the extent of reference to themselves versus references to the external field and particularly to other persons. Thus, it has been found (Jennings, 1967) that field-dependent persons make fewer self-references in their speech. Confirming this, Luborsky (personal communication) found that the ratio of other-people-references to self-references was significantly higher in the speech of field-dependent persons; that is, proportionately, they referred more to other people than to themselves. As still another example, Doob (1958) found that field-independent persons more often use the personal pronoun and active verbs.

Findings such as these suggest that in what they are likely to talk about, people with contrasting cognitive styles reflect the differences in their overall personal orientations. If when nominally discussing the same topic, two people are in effect talking about different things, in other words not "speaking the same language," it is not likely that they will get along very well. That people of similar cognitive style do better at "reading" each other's verbal messages is suggested by a finding of Shows (1967). In this study Shows had field-dependent and field-independent persons prepare verbal descriptions of a series of pictures. Subjects of a given cognitive style did significantly better in matching verbal description to picture when they were given descriptions prepared by subjects of the same cognitive style as themselves.

There is another kind of communication mode in which field-dependent and field-independent persons are different. Building on an earlier observation that, in the course of interaction, persons differing in characteristic rate of speech are likely to adapt their speech rates to each other, Marcus (1970) examined this congruence phenomena as a function of field dependence. She found that movement toward congruence in an interaction between people was the particular contribution of the relatively more field-dependent partner. In this evidence of the field-dependent person's greater sensitivity in tracking the speech of others, we have still another demonstration of their attentiveness to other people.

Finally, in still another communication modality--hand jestures accompanying speech--field-dependent and field-independent persons again are different (Freedman, O'Hanlon, Oltman & Witkin, 1972).

These observations suggest that specific features of the communication modes commonly involved in human interaction are associated with cognitive style. It seems that persons of the same cognitive style "emit" similar signs. To the extent that this puts them on the same "wave length," it is reasonable that they should do better with each other. It seems equally reasonable that communication should be less effective between persons of contrasting cognitive style, making for greater difficulty in getting along.

As I mentioned, my colleagues and I are pursuing some of these ideas about how match or mismatch in cognitive style may affect social interaction. In one study, now completed, we are examining dyadic interactions, under conditions of initial conflict. In another study we are examining teacher-student interactions. The main purpose of this study is to identify the specific interaction processes through which match in cognitive style leads to mutual positive evaluation and mismatch to mutual negative evaluation. In this study, we have begun to collect data for teacher-student groups in which each teacher is put together, on one occasion, with a group of students all matched to her in cognitive style, and on another occasion, with a mismatched group. She teaches the same subject matter to both groups. Teachers and students are being assessed not only for field-dependence-independence but for other cognitive styles as well, and also for additional stylistic tendencies, such as open-closed mindedness and internal-external locus of control. This is a move toward examining the influence of patterns of styles in the social interaction process. We are encouraged about the value of examining the influence of other styles, as well as patterns of styles by the report of Beller (1967) that children characterized as showing

a descriptive-analytical or contextual-rational cognitive style tend to do better with teaching methods adapted to their particular style, even though his finding was not confirmed by Coop and Brown (1971).

In concluding this discussion of teacher-student interaction I should stress that I have focused on the positive features of match between teachers and students in cognitive style only because that is what the evidence on hand at this moment has shown. A decision on which teacher-student combination achieves the best learning results obviously requires consideration of many other cognitive styles, as well as variables of other sorts. To make appropriate decisions about teacher-student mixes, we need to build up a fund of knowledge, gained through systematic research, on the many other variables that influence teaching and learning effectiveness. I hope the pathway on which we have embarked in our studies will enrich this fund of knowledge.

V. Conclusions

Application of the concepts, techniques and findings from cognitive-style research to problems of education is just in its beginning phase. Sparse as the evidence I have been able to muster therefore is, I trust it has been sufficient to demonstrate the potential value of a cognitive-style approach to a wide range of educational problems.

Perhaps the best way to summarize the value of this approach is to note some of the ways in which it is particularly suited to the kind of sizing up of students and teachers needed in the educational setting and to identify some of its advantages for this task over standard intelligence tests.

First of all, cognitive-style research is leading to the identification of a number of salient cognitive dimensions, beyond those now represented on typical intelligence tests. This, together with the fact that cognitive style encompasses perceptual as well as intellectual functioning, means that the cognitive-style approach gives promise of more comprehensive coverage of the cognitive domain than do our usual intelligence tests. Moreover, because cognitive styles are dimensions of individual functioning which extend into the personality domain, they carry a message about the student and teacher as persons. Hence characterization of an individual in terms of cognitive style covers a great deal of psychological territory.

As I noted elsewhere (Witkin, 1969) "...It is not far-fetched to imagine that test batteries emerging from cognitive-style research may in time replace intelligence tests. Historically, the development of intelligence tests outran the development of a theory of intelligence. This is understandable, since under the compelling need to classify children in the schools, test development did not await adequate theory. The tests that have emerged accordingly have more of an empirical basis than a theoretical basis. Essentially they consist of groups of tasks which, by experience, have been found to discriminate between slow-learning and fast-learning children....But we do not know as much as we should about the psychological processes involved in carrying out these tasks. Nor do we always have an adequate rationale for using the particular tasks we do. In fact, there is the paradox that much work has been going into finding a conceptual rationale for these tasks <u>after</u> they have long been in use...the work on cognitive style is following the course toward test development that

might have been taken in the first place (and most appropriately should have been taken), had time allowed. This is a progression from theory, to specific test rationale, to test construction" (pages 218-219).

It is worth noting here that the tests now used to assess individual differences in field-dependence-independence emerged after half a dozen years of intensive research my colleagues and I did on the perceptual processes underlying performance in the kinds of perceptual tasks these tests feature. Test standardization, which we undertook only after our interest in individual differences developed, was obviously enormously aided by knowledge gained through the basic perceptual research which preceded it. This kind of history of test development makes it more possible to infer underlying process from scores achieved on such tests than with the usual intelligence tests, with their quite different developmental histories.

Another important contrast between a cognitive-style approach and the abilities approach emphasized in intelligence tests lies in their implications for placement in the broadest sense. With abilities, virtue lies in their possession; to lack them is to be deficient. The value emphasis is thus unipolar. With cognitive styles, on the other hand, the cognitive and personal characteristics involved allow persons at either pole a proper share in the Lord's work. As we saw, relatively field-dependent and field-independent persons gravitate, appropriately, toward different subject-matter areas in school and toward different occupations afterwards. We also saw that each style contributes to greater achievement in the area to which it is suited. Recall, for example, that field-

independent student nurses did particularly well in surgery; field-dependent student nurses did particularly well in psychiatry.

With growing knowledge about salient cognitive styles, I am confident that in time we will be able to identify each person's "cognitive map," composed of his particular cognitive styles. A major factor-analytic study of cognitive styles, in progress for a number of years under the leadership of our chairman, Dr. Messick, is now nearing completion. Represented in this work have been all the cognitive styles on record. Those of us who have been close to this research expect, with good reason, that it will lead to a major advance in the definition and codification of cognitive styles, and in the identification of reliable tests for a number of cognitive styles which have not yet been examined to the same degree as the field-dependence-independence dimension.

Cognitive maps offer promise of a rich, complex and comprehensive way of characterizing individuals both in their cognitive functioning and in their broader functioning as persons. An individual's cognitive map represents his unique cognitive makeup, including areas of strength and weakness. An outcome of the cognitive-map approach is to emphasize the multiplicity of ways in which people may be different from each other. This contrasts with the encouragement to think in terms of "more" or "less" to which uni-dimensional measures such as the IQ lead us. The cognitive-map concept emphasizes individuality and deemphasizes placement along a single better-or-worse continuum. For us, as educators, individuality is surely a quality to be cherished in our appreciation of students and teachers.

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